

REMARKS

In accordance with the foregoing, the specification has been amended to improve form. No new matter is presented in this Amendment.

Claims 1 – 14 are pending. Claims 4 – 7 and 11 – 12 are withdrawn from consideration, and claims 1 – 3, 8 – 10, 13 and 14 are under consideration. (The Office Action Summary incorrectly indicates that only claims 1 – 3, 8 – 10, 13 and 14 are pending.)

Objection to the specification

At page 3 of the Office Action, the Examiner objected to the disclosure because of an alleged informality in amended paragraph [0039]. The Examiner suggested deleting the phrase “polytetrafluoroethylene (PTFE),” presumably because the term “polytetrafluoroethylene” appears twice in the paragraph. For the following reasons, this objection is respectfully traversed and reconsideration is requested.

Paragraph [0039] is amended herein to delete the phrase “TEFLON (polytetrafluoroethylene)” and insert the phrase “such as, for example, TEFLON” after the phrase “polytetrafluoroethylene (PTFE),” thereby clarifying that TEFLON is a form of polytetrafluoroethylene. Therefore, the rejection should be withdrawn.

Rejection of claims 1 – 3 under 35 U.S.C. §103(a) over JP 10-302779

At page 3 of the Office Action, claims 1 – 3 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP Patent 10-302779 (hereinafter JP '779). Regarding claim 1, the Examiner alleged that JP '779 describes a cathode active material comprising a lithium transition metal in which a carbon compound is adsorbed. In particular, the Examiner alleged that the method of thermally treating the lithium transition metal composite oxide described in JP '779 is similar to that disclosed in the present application and that therefore, the carbon would obviously be adsorbed to obtain a carbon content of 10 – 1,000 ppm. Regarding claim 2, the Examiner alleged that it would have been obvious to select any transition metal to obtain a lithium transition metal composite oxide of the formula set forth in the claim. Regarding claim 3, the Examiner alleged that because the method of thermally treating the lithium transition metal composite oxide described in JP '779 is similar (according to the Examiner) to that disclosed in the present application the product of JP '799 would obviously include a carbon compound having a surface area of 10 – 5,000 m²/g. For the following reasons, this rejection is respectfully traversed and reconsideration is requested.

Independent claim 1 relates to a cathode active material comprising a lithium transition metal composite oxide in which a carbon compound is adsorbed to obtain a carbon content of 10-1,000 ppm. JP '799 does not teach or suggest a cathode active material comprising a lithium transition metal composite oxide in which a carbon compound is adsorbed to obtain a carbon content of 10 - 1,000 ppm. Contrary to what is alleged by the Examiner, the presence of a carbon compound adsorbed to obtain a carbon content of 10 -1,000 ppm cannot be inferred from an alleged similarity of the thermal treatment method described in JP '799 with the described method of preparation of the cathode active material of claim 1, since the methods are in fact not similar. In particular, although claim 1 is not limited to a particular method of preparation, the specification describes that the cathode active material may be prepared by mixing a transition metal compound and a lithium compound in a molar ratio of 1:1.0-1:1.2; and thermally treating the mixture while supplying CO₂ and O₂ in a ratio of partial pressures ranging from 1:0.001-1:1000. It is also described that the thermal treatment may be at a preferred range of between 600 °C and 1000 °C. JP '799, on the other hand, describes that its material is formed by forming and calcining a lithium composite oxide and then, subsequently, treating the formed, calcined lithium composite oxide with a gas containing CO₂ at a preferred temperature of less than 150 °C. Therefore, the method described in the specification for forming the cathode active material of claim 1 differs from the method described in JP '799 for forming its material in the following aspects: the content of the gas that is applied (a mixture of CO₂ and O₂ according to the present specification; CO₂ in JP '799), the stage in the formation process in which a gas is applied (during formation of a lithium composite oxide according to the present specification; after a lithium composite oxide has been formed, calcined and allowed to cool in JP '799) and the temperature at which the gas treatment is carried out (preferably 600 °C and 1000 °C according to the present specification; 150 °C or below in JP '799). Therefore, it cannot be inferred from the synthesis method described in JP '799 that its material would meet the limitations of claim 1.

In fact, it can be concluded from the different purposes that the gas treatment serves in the cathode active material of the present application and the material of '799 that the two materials would necessarily have to be different. Aspects of the present application are directed to the problem of assuring that a current cut-off device that responds to internal pressure is activated when the battery temperature rises above a normal range. This problem is addressed by providing a cathode active material that has a carbon compound adsorbed thereon at a concentration of 10 -1,000 ppm. When the temperature of the battery rises above the normal range, the adsorbed carbon compound forms gases that raise the internal pressure of the

battery, thereby assuring that the cut-off device is activated (see, for example, paragraphs [0020] – [0022] of the present specification). In JP '779, it is described that a CO₂ treatment is applied to “carbonate-ize” lithium hydroxide and lithium oxide that remains after formation of a lithium multiple oxide. It is not described that the resulting products are adsorbed on the cathode active material as recited in the present claims. In fact, it is described in JP '779 that its battery is intended for use in hot environments (see, for example, paragraph [0007] of JP '779). Therefore, it would not be desirable in the battery described in JP '779 to have a cathode active material that includes an adsorbed carbon compound, since an undesirable rise in pressure would be generated by gases created by the carbon compound at the intended high operating temperatures of the battery. Accordingly, it can be concluded that JP '779 does not teach or suggest a cathode active material comprising a lithium transition metal composite oxide in which a carbon compound is adsorbed to obtain a carbon content of 10-1,000 ppm as recited by independent claim 1. Therefore, the rejection should be withdrawn.

Rejection of claims 8 – 10 and 13 under 35 U.S.C. §103(a) as being unpatentable over Inoue et al. (U.S. Patent 5,707,758) in view of JP '779

At page 4 of the Office Action, claims 8 – 10 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Inoue et al. (U.S. Patent 5,707,758) in view of JP '779. The Examiner alleged that Inoue et al. describes a cathode comprising a cathode active material that comprises a lithium transition metal composite oxide, an anode, a separator, an electrolyte and a current cut-off device that operates in response to a rise in an internal pressure of the battery. The Examiner acknowledged that Inoue et al. does not describe a cathode active material comprising a lithium transition metal in which a carbon compound is adsorbed to obtain a carbon content of 10 – 1,000 ppm. The Examiner alleged that JP '779 describes a cathode active material comprising a lithium transition metal in which a carbon compound is adsorbed. As mentioned above, the Examiner alleged that the method of thermally treating the lithium transition metal composite oxide described in JP '779 is similar to that disclosed in the present application and that therefore, the carbon would obviously be adsorbed to obtain a carbon content of 10 – 1,000 ppm. The Examiner took the position that it would have been obvious to substitute the cathode active material of Inoue with the cathode active material of '779 on the alleged grounds that '779 discloses a cathode active material having a high capacity and storage characteristics under high temperature conditions, thereby improving the overall cycle life and performance of the battery. Regarding claim 9, the Examiner alleged that it would have

been obvious to select any transition metal to obtain a lithium transition metal composite oxide of the formula set forth in the claim. Regarding claim 10, the Examiner alleged that because the method of thermally treating the lithium transition metal composite oxide described in JP '779 is similar (according to the Examiner) to that disclosed in the present application the product of JP '799 would obviously include a carbon compound having a surface area of $10 - 5,000 \text{ m}^2/\text{g}$. Regarding claim 13, the Examiner alleged that Inoue et al. discloses a separator selected from the group consisting of a glass fiber, polyethylene and polypropylene. For the following reasons, this rejection is respectfully traversed and reconsideration is requested.

Independent claims 8 and 9 recite, among other limitations, a cathode active material comprising a lithium transition metal in which a carbon compound is adsorbed to obtain a carbon content of $10 - 1,000 \text{ ppm}$. As acknowledged by the Examiner, Inoue et al. does not describe the cathode active material as recited in independent claims 8 and 9. As discussed above, JP '779 also does not teach or suggest the recited cathode active material comprising a lithium transition metal in which a carbon compound is adsorbed to obtain a carbon content of $10 - 1,000 \text{ ppm}$. Therefore, the rejection should be withdrawn.

Rejection of claim 14 under 35 U.S.C. §103(a) as being unpatentable over Inoue et al. in view of JP '779 and further in view of Parker et al. (U.S. Patent 6,692,873)

At page 7 of the Office Action, claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Inoue et al. (U.S. Patent 5,707,758) in view of JP '779 as applied to claim 9 above, and further in view of Park et al. (U.S. Patent No. 6,692,873) (referred to by the Examiner throughout the Office Action as "Parker et al."). The Examiner acknowledged that Inoue et al. does not describe a vinylidene fluoride-hexafluoropropylene copolymer having $8 - 25\%$ by weight of hexafluoropropylene, but alleged that this material is described in Park et al. The Examiner took the position that it would have been obvious to have modified the binder of Inoue et al. by incorporating the binder, on the alleged grounds that Park et al. teaches that the binder would have formed uniform pores in the electrodes and separator and provided excellent porosity characteristics and excellent adhesion between the separator and electrodes, thereby providing a battery having excellent lifetime characteristics, high performance and low temperature characteristics. For the following reasons, this rejection is respectfully traversed and reconsideration is requested.

Claim 14 depends from independent 9, which, as discussed above, recites, among other limitations, a cathode active material comprising a lithium transition metal in which a carbon

compound is adsorbed to obtain a carbon content of 10 – 1,000 ppm. As discussed above, neither Inoue nor JP '779 teach or suggest the recited cathode active material. Likewise, Park et al. does not teach or suggest a cathode active material comprising a lithium transition metal in which a carbon compound is adsorbed to obtain a carbon content of 10 – 1,000 ppm. Therefore, Inoue et al., JP '779 and Park et al., singly or combined, do not teach or suggest the limitations of independent claim 9, from which claim 14 depends.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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